

Number, Operation, and Quantitative Reasoning

Activity: What's Left?

- TEKS:** (5.3) **Number, Operation, and Quantitative Reasoning.** The student adds, subtracts, multiplies and divides to solve meaningful problems.
The student is expected to:
- (C) use division to solve problems involving whole numbers (no more than two-digit divisors and three-digit dividends without technology), including interpreting the remainder within a given context;
- (5.14) **Underlying processes and mathematical tools.** The student applies Grade 5 mathematics to solve problems connected to everyday experiences and activities in and outside of school.
The student is expected to:
- (A) identify the mathematics in everyday situations;
 - (B) solve problems that incorporate understanding the problem, making a plan, carrying out the plan, and evaluating the solution for reasonableness;
 - (C) select or develop an appropriate problem-solving plan or strategy, including drawing a picture, looking for a pattern, systematic guessing and checking, acting it out, making a table, working a simpler problem or working backwards to solve a problem; and
 - (D) use tools such as real objects, manipulatives, and technology to solve problems.
- (5.15) **Underlying processes and mathematical tools.** The student communicates about Grade 5 mathematics using informal language.
The student is expected to:
- (A) explain and record observations using objects, words, pictures, numbers, and technology; and
 - (B) relate informal language to mathematical language and symbols.
- (5.16) **Underlying processes and mathematical tools.** The student uses logical reasoning.
The student is expected to:
- (B) justify why an answer is reasonable and explain the solution process.

Note: Portions of this lesson address TEKS at other grade levels as well; however, the intent of the lesson fits most appropriately at the grade level indicated.

Overview: Students will be expected to interpret remainders based on the context of the problem. Some remainders will be fractions, some will be decimals, some will need to be rounded up, and some remainders will need to be dropped from the answer altogether.

Materials: *A Remainder of One* by Elinor J. Pinczes (ISBN 0-395-69455-8)
Remainder Riddle – Handout/Transparency 1
Steps for Writing a Remainder Riddle – Handout/Transparency 2
What Should We Do With the Leftovers? – Handout/Transparency 3
What's Left??? – Handout/Transparency 4
 12 x 18 inch paper, one sheet per student

Grouping: Large group, pair, and individual

Time: 1 class

Lesson:

Procedures	Notes
<p>1. Read the book, <i>A Remainder of One</i> by Elinor J. Pinczes, to the class.</p> <p>After reading the book, have someone else read the book aloud and record what happens mathematically.</p> <p>25 divided by 2 = 12 remainder 1 25 divided by 3 = 8 remainder 1 25 divided by 4 = 6 remainder 1 25 divided by 5 = 5 remainder 0</p> <p>Discuss what each sentence means and how it relates to the story.</p> <p>Have students use counters to represent the bug soldiers for each division problem to justify their answers.</p>	<p>In <i>A Remainder of One</i>, a troop of 25-bug soldiers line up in 2 lines, leaving soldier Joe alone at the end of the line. The queen "likes things tidy" and is unhappy with a single bug at the end of the line, so Joe has to stand aside and watch the troop march without him. Over the next few days, the bug soldiers line up with three and then four in each line, again leaving out Joe. Finally, the bugs line up with five in each row, "perfect at last and that's counting Joe." The story leads to an activity in which students have to make sense of remainders.</p> <p>The remainder of a problem has nothing to do with what grade a student is in or how old they are. Instead, it has to do with the nouns in the problem. Remember numbers are adjectives! They describe nouns. When put in context, even young children know what to do with the remainder.</p>

Procedures	Notes
<p>2. In the story, 25 bugs lined up in different ways. Present <i>Remainder Riddle</i> (Handout/Transparency 1) to the class.</p> <p>Tell students the missing number is between 1 and 25. The students must use the seven clues to find the missing number. Model for the class how to use each of the seven clues to learn more about the missing number.</p> <p>Ask: What do we know about the number from the riddle clues that say there is a remainder of 0 when this number is divided by 1, 2, or 5? <i>This number has factors of 1, 2 and 5.</i></p> <p>Ask: What do we know about this number from the riddle clues that tell us there is a remainder when this number is divided by 3, 4, 6, and 7? <i>This number is not evenly divisible by 3, 4, 6 and 7.</i></p> <p>Ask students to use the Think/Pair/Share method to answer the Remainder Riddle.</p>	<p>A multiple is the product of a whole number and any other whole number. When you skip count, you are saying the multiples of a number. For example, the first 6 multiples of 10 are 10, 20, 30, 40, 50, and 60.</p> <p>A factor is a number that divides evenly into a larger number. For example, the factors of 10 are 1, 2, 5 and 10.</p> <p>The Think/Pair/Share method allows all students in the class to communicate. Each student first thinks the answer. Then each student pairs up with a partner to hear each other's answers and discuss why they think their answer is correct if they choose different numbers. Last, the pairs share with the class the answer upon which they have agreed.</p>
<p>3. Each student should write a Remainder Riddle of their own for any other number between 10 and 35.</p> <p>Each riddle should have seven clues, just like the example. Students can use the clues from Handout/Transparency 1 as a model. Have them copy the clues and put in the correct numbers for the remainders of their secret Remainder Riddle numbers. The students should write their secret Remainder Riddle numbers on the backs of their papers.</p>	<p>Use Handout/Transparency 2 to show students the steps for writing a Remainder Riddle.</p>
<p>4. Have students exchange papers with a friend and try to solve each other's riddles.</p>	
<p>5. Use <i>What Should We Do With the Leftovers?</i>, (Handout/Transparency 3), to present the problem to the students.</p>	<p>Only show one problem to the class at a time. Keep all the other problems on the transparency</p>

Procedures	Notes
<p>Ask: What is the answer to 26 divided by 5? <i>Often students respond "5 remainder 1."</i></p> <p>Record the answer on the transparency.</p>	covered.
<p>6. Read the next problem to the class and ask students to tell you the answer. <i>\$5.20</i></p> <p>Ask: How did you get that answer? <i>Often students report that they divided 26 by 5.</i></p> <p>Ask: Why does "26 divided by 5" have an answer of "5 remainder 1" on the first problem, but now the answer is \$5.20 on this problem?</p>	The purpose of this activity is to get students to interpret the remainder. Students should not just think of remainders as "R1" or "1 left over." Remainders must be put into context and be dealt with accordingly.
<p>7. Ask for the answer on the next problem. <i>5 and one-fifth candy bars</i></p> <p>Ask: How does the remainder of \$0.20 in the previous problem relate to the remainder of one fifth in this problem? <i>\$0.20 is one-fifth of a dollar</i></p>	Continue to ask how the class found the answer to the problem and why the answer is different from the previous problem.
<p>8. Ask for the answer on the next problem. <i>6 adults</i></p> <p>Ask: What happened to the remainder? <i>The remainder was used to force the answer up to next highest whole number. One adult is needed for every five children and then one adult is needed to be with the one child "left over."</i></p>	Continue to ask how the class found the answer to the problem and why the answer is different from the previous problem.
<p>9. Ask for the answer on the next problem. <i>5 antique comic books</i></p> <p>Ask: What happened to the remainder? <i>The remainder was discarded, leaving a whole number answer. Jeff had enough money to buy only 5 antique comic books. He had one dollar left over.</i></p>	Continue to ask how the class found the answer to the problem and why the answer is different from the previous problem.

Procedures	Notes
<p>10. Ask for the answer on the next problem. <i>about 5 pieces of candy each</i></p> <p>Ask: What happened to the remainder? <i>The remainder is not used because only an approximate answer is needed.</i></p>	<p>Continue to ask how the class found the answer to the problem and why the answer is different from the previous problem.</p>
<p>11. Compare and contrast these problems. Ask students to think of the different things that happened to the remainders of these problems.</p> <ul style="list-style-type: none"> <i>The remainder was recorded as a decimal.</i> <i>The remainder was recorded as a fraction.</i> <i>The remainder was used to force the answer to next highest whole number.</i> <i>The remainder was discarded, leaving a whole number answer.</i> <i>The remainder is not used because only an approximate answer is needed.</i> 	
<p>12. Have students fold a piece of 12 x 18 paper into 6 equal sections.</p> <p>Give the students a new dividend and divisor (like 26 divided by 5) and ask them to write 6 different problems using this dividend and divisor. Then, students should record the answers for each of the problems they write. Only one problem may be straight computation without words. Encourage students to try to think of a problem that will be an example of each of the different ways remainders can be used.</p>	
<p>13. Allow students to share their problems and discuss how their remainders are expressed.</p>	

Homework: Assign *What's Left???* – Handout/Transparency 4.

Answers are:

1. 7 boxes
2. 10 days

3. *2 apples*
4. *7 days*
5. *3 dozen*

Assessment: Ask students to write a problem where the remainder may be expressed in the following ways:

- as a decimal
- as a fraction
- is discarded
- forces the answer to the next whole number
- is rounded

Resources: Lovin, L.H., & Van de Walle, J. A. (2006). Teaching student-centered mathematics: Grades 3-5. Boston: Pearson Education, Inc.

McAnallen, R. (2001). Wonderful Ideas, May/June 2001, Volume Xii, Number 5.

Remainder Riddle

I am thinking of a number.

When you divide my number by 1, the remainder is 0.

When you divide my number by 2, the remainder is 0.

When you divide my number by 3, the remainder is 1.

When you divide my number by 4, the remainder is 2.

When you divide my number by 5, the remainder is 0.

When you divide my number by 6, the remainder is 4.

When you divide my number by 7, the remainder is 3.

What is my number?

Handout/Transparency 1

Steps for Writing a Remainder Riddle

- Choose a number between 10 and 35.
- Divide your chosen number by 1, 2, 3, 4, 5, 6, and 7. Write down the remainder for each division problem.
- Copy the clues from Handout/Transparency 1, leaving the numerals blank.
- Put in the correct numerals for your riddle.

Handout/Transparency 2

What Should We Do With the Leftovers?

$$26 \div 5$$

Karen earned \$26.00 for 5 hours work. How much did she earn each hour?

Ann wants to share 26 rectangular candy bars with her 4 best girlfriends. If each of the 5 girls gets the same amount, how much will each girl get?

On a field trip, you are required to have one adult for every five students. For a class of 26 students, how many adults are necessary?

At a garage sale, Jeff would like to buy antique comic books that are on sale for \$5.00 each. If he has \$26.00, how many comic books can he buy?

Five children are planning to share a bag of 26 pieces of candy. About how many pieces will each child get?

Handout/Transparency 3

What's Left???

Solve the following problems. Show your work.

1. At Maria's Apple Orchard, 56 apples are being packed into boxes. Each box could hold only 9 apples. How many boxes are needed?
2. John has to plant 73 apple trees. He can plant 8 apple trees each day. How many days will it take to plant all of the apple trees?
3. Lauren brought 29 apples home. She divided them equally into 3 sacks to give to her teachers. How many apples will be left over?
4. Maria would like to sell 60 boxes of apples this week. If she sells 9 boxes each day, how many days will it take her to sell all 60 boxes?
5. Mr. Spalding has \$15.00 to spend at the apple orchard. Apples are sold at \$4.00 per dozen. How many dozen apples can Mr. Spalding buy?

Transparency/Handout 4